Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode comprising a portion of said chamber wall, said electrode having plural gas injection orifices therein generally facing said workpiece support;

an RF power generator for supplying power at a frequency of said generator to said overhead electrode and capable of maintaining a plasma within said chamber at a desired plasma ion density level;

said overhead electrode having a reactance that forms a resonance with the plasma at an electrode-plasma resonant frequency which is at or near said frequency of said generator;

an insulating layer formed on a surface of said overhead electrode facing said workpiece support.

Claim 2 (original): The reactor of Claim 1 further comprising:

a capacitive insulating layer between said RF power generator and said overhead electrode.

Claim 3 (original): The reactor of Claim 2 further comprising:

a metal foam layer overlying and contacting a surface of said overhead electrode that faces away from said workpiece support.

Claim 4 (original): The reactor of Claim 1 further comprising a silicon-containing coating covering said insulating layer.

Claim 5 (original): The reactor of Claim 4 wherein said silicon-containing coating comprises one of silicon or silicon carbide.

Claim 6 (original): The reactor of Claim 3 wherein said insulating layer provides a capacitance sufficient to suppress arcing within said gas injection ports.

Claim 7 (original): The reactor of Claim 6 wherein said capacitive insulating layer has a sufficient capacitance to block D.C. current from a plasma within said chamber from flowing through said overhead electrode.

Claim 8 (original): The reactor of Claim 7 wherein said metal foam layer is of a sufficient thickness to suppress an axial electric field within said gas injection orifices.

Claim 9 (original): The reactor of Claim 1 wherein said overhead electrode comprises aluminum and said insulating layer is formed by anodization.

Claim 10 (original): The reactor of Claim 2 wherein said capacitive insulating layer forms a capacitance that provides a low impedance path to ground through said overhead electrode for plasma sheath generated harmonics.

Claim 11 (original): The reactor of Claim 1 further comprising:

a gas inlet to said overhead electrode;

a gas baffling layer within said overhead electrode between said gas inlet and at least a first set of said gas injection orifices.

Claim 12 (original): The reactor of Claim 11 wherein said gas baffling layer comprises a layer of metal foam.

Claim 13 (original): The reactor of Claim 9 further comprising thermal control fluid passages within said overhead electrode.

Claim 14 (original): The reactor of Claim 13 further comprising an optical window in said overhead electrode generally facing said wafer support and a light carrying medium coupled to said window and extending through said overhead electrode.

Claim 15 (original): The reactor of Claim 1 wherein said plasma has a reactance and the reactance of said electrode corresponds to the reactance of said plasma.

Claim 16 (original): The reactor of Claim 15 wherein the reactance of said electrode is a conjugate of the reactance of said plasma.

Claim 17 (original): The reactor of Claim 15 wherein the reactance of said plasma comprises a negative capacitance, and wherein the capacitance of said electrode is the same magnitude as the magnitude of said negative capacitance of said plasma.

Claim 18 (original): The reactor of Claim 1 wherein the frequency of said RF generator and the electrode-plasma resonant frequency are VHF frequencies.

Claim 19 (original): The reactor of Claim 18 wherein said plasma reactance is a function of said plasma ion density and said plasma ion density supports a selected plasma process of said reactor.

Claim 20 (original): The reactor of Claim 19 wherein said plasma process is a plasma etch process and wherein said plasma ion density lies in a range from about 10^9 ions/cubic centimeter to about 10^{12} ions/cubic centimeter.

Claim 21 (original): The reactor of Claim 1 further comprising a fixed impedance matching element connected between said generator and said overhead electrode, said fixed impedance match element having a match element resonant frequency.

Claim 22 (original): The reactor of Claim 21 wherein the match element resonant frequency and said electrode-plasma resonant frequency are offset from one another and the frequency of said generator lies between said electrode-plasma resonant frequency and said match element resonant frequency.

Claim 23 (original): The reactor of Claim 22 wherein said frequency of said generator, said plasma frequency and said match element resonant frequency are all VHF frequencies.

Claim 24 (original): The reactor of Claim 21 wherein said fixed impedance match element comprises:

a strip line circuit having a near end thereof adjacent said overhead electrode for coupling power from said RF power

generator to said overhead electrode and providing an impedance transformation therebetween, said strip line circuit comprising:

a strip line conductor generally above said overhead electrode and connected at a near end thereof to said overhead electrode,

a ground plane conductor above said overhead electrode and spaced from said inner conductor along the length thereof and connected to an RF return potential of said RF power generator,

a tap at a selected location along the length of said strip line conductor, said tap comprising a connection between said strip line conductor and an output terminal of said RF power generator.

Claim 25 (original): The reactor of 24 wherein said ground plane conductor comprises a ceiling of a housing overlying said overhead electrode, said strip line conductor formed along a winding path within said housing and beneath said ceiling.

Claim 26 (original): The reactor of Claim 25 wherein said strip line conductor is hollow, said reactor further comprising:

a gas feed line extending through said hollow strip line conductor for supplying process gas to said gas injection orifices in said overhead electrode.

Claim 27 (currently amended): The reactor of Claim 26 further comprising:

fluid passages in or on said overhead electrode for accommodating flow of heat conducting fluid;

a fluid supply line extending through said hollow strip line conductor for supplying heat conducting fluid to fluid passages.

Claim 28 (original): The reactor of Claim 24 further comprising a shorting conductor connected at a far end of said strip line conductor to said ground plane conductor.

Claim 29 (original): The reactor of Claim 25 wherein the length of said strip line conductor between said near and far ends is equal to a multiple of a quarter wavelength of said match element resonant frequency of the strip line circuit.

Claim 30 (original): The reactor of Claim 29 wherein said multiple is two whereby said length of said strip line conductor is a half-wavelength at said match element resonant frequency.

Claim 31 (original): The reactor of Claim 30 wherein said frequency of said RF power generator, said match element resonant frequency and said electrode-plasma resonant frequency are all VHF frequencies offset from one another.

Claim 32 (original): The reactor of Claim 25 wherein said selected location is a location along the length of said strip line conductor at which a ratio between a standing wave voltage and a standing wave current in said strip line circuit is at least nearly equal to an output impedance of said RF power generator.

Claim 33 (original): The reactor of Claim 25 wherein said selected location of said tap is shifted from an ideal location at which said ratio is equal to said output impedance, the shift being sufficient to realize an addition of current at said tap whenever the load impedance at said overhead electrode decreases below a nominal level and to realize a subtraction of current at said tap whenever the load impedance at said overhead electrode increases above a nominal level.

Claim 34 (original): The reactor of Claim 33 wherein the shift from said ideal location is about 5% of one wavelength of the VHF frequency of said RF generator.

Claim 35 (original): The reactor of Claim 34 wherein the shift from said ideal location is such that at least a 6:1 increase in resistive match space is realized.

Claim 36 (original): The reactor of Claim 24 wherein said characteristic impedance of said strip line circuit is about 30% less than the output impedance of said RF power generator.

Claim 37 (original): The reactor of Claim 21 wherein said strip line circuit has a characteristic impedance which is less than the output impedance of said RF power generator.

Claim 38 (original): The reactor of Claim 21 further comprising an insulating seal between said overhead electrode and a remaining portion of said chamber wall, the dielectric constant of said insulating seal and the area of said overhead electrode being such that said plasma in said chamber resonates with said overhead electrode at said electrode-plasma resonant frequency.

Claim 39 (original): The reactor of Claim 25 wherein said strip line conductor has an oval cross-sectional shape, a major surface of said oval shape of said strip line conductor facing said ground plane conductor.

Claim 40 (original): The reactor of Claim 21 further comprising an HF frequency bias power generator and an impedance match circuit connected between said HF frequency bias power generator and said wafer support, wherein the frequency of said

RF power generator connected to said electrode, said electrode-plasma resonant frequency and said match element resonant frequency are VHF frequencies.

Claim 41 (original): The reactor of Claim 40 wherein said wafer support provides an RF return path for VHF power coupled into said chamber from said overhead electrode.

Claim 42 (original): The reactor of Claim 40 further comprising:

a thin insulator layer between said overhead electrode and said strip line conductor, said thin insulating layer providing sufficient capacitance to block D.C. current flow through said overhead electrode from plasma within the chamber.

Claim 43 (original): The reactor of Claim 42 wherein the capacitance provided by said thin insulator layer forms a resonance at a selected HF frequency for current flow from said chamber, through said overhead electrode to said strip line conductor.

Claim 44 (original): The reactor of Claim 43 wherein said selected HF frequency of said resonance is equal to a plasma sheath-generated harmonic of the fundamental frequency of said HF bias power generator.

Claim 45 (original): The reactor of Claim 22 further comprising a semiconductive annular ring surrounding the periphery of said wafer, said ring extending an effective return electrode area presented to VHF power coupled into said chamber from said overhead electrode.

Claim 46 (original): The reactor of Claim 45 further

comprising an insulating annulus supporting said ring and insulating said ring from said chamber wall, the dielectric constant of said ring determining apportionment of VHF power return current between said wafer support and said semiconductor ring.

Claim 47 (original): The reactor of Claim 46 wherein the effective return electrode area for VHF power coupled into said chamber from said overhead electrode exceeds the area of said overhead electrode.

Claim 48 (original): The reactor of Claim 25 wherein the combination of said overhead electrode with said strip line circuit provides an RF return path for HF power coupled into said chamber from said wafer support, said overhead electrode having an area greater than the area of said wafer support.

Claim 49 (original): The reactor of Claim 48 further comprising a capacitive element between said overhead electrode and said fixed impedance matching element, the capacitive element having a capacitance sufficient to provide DC isolation between said plasma and said fixed impedance matching element.

Claim 50 (original): The reactor of Claim 49 wherein said capacitance of said capacitive element renders said RF return path resonant at a selected HF frequency.

Claim 51 (original): The reactor of Claim 50 wherein said frequency is a harmonic of the bias power generator fundamental.

Claim 52 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing

a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode comprising a portion of said chamber wall;

an RF power generator for supplying power at a frequency of said generator to said overhead electrode and capable of maintaining a plasma within said chamber at a desired plasma ion density level;

said overhead electrode having a capacitance such that said overhead electrode and the plasma formed in said chamber at said desired plasma ion density resonate together at an electrode resonant frequency, said frequency of said generator being at least near said electrode-plasma resonant frequency;

an insulating layer formed on a surface of said overhead electrode facing said workpiece support;

a capacitive insulating layer between said RF power generator and said overhead electrode;

a metal foam layer overlying and contacting a surface of said overhead electrode that faces away from said workpiece support.

Claim 53 (original): The reactor of Claim 52 wherein:

said insulating layer provides a capacitance sufficient to suppress arcing within said gas injection ports;

said capacitive insulating layer has a sufficient capacitance to block D.C. current from a plasma within said chamber from flowing through said overhead electrode; and

said metal foam layer is of a sufficient thickness to suppress an axial electric field within said gas injection orifices.

Claim 54 (original): The reactor of Claim 53 further comprising a silicon-containing coating covering said insulating layer.

Claim 55 (original): The reactor of Claim 54 wherein said silicon-containing coating comprises one of silicon or silicon carbide.

Claim 56 (original): The plasma reactor of Claim 53 further comprising a fixed impedance matching element connected between said generator and said overhead electrode, said fixed impedance matching element having a match element resonant frequency.

Claim 57 (original): The reactor of Claim 56 wherein said fixed impedance matching element comprises a strip line circuit.

Claim 58 (original): The reactor of Claim 56 wherein said fixed impedance matching element comprises a coaxial tuning stub.

Claim 59 (original): The plasma reactor of Claim 56 wherein said frequency of said generator lies between said electrode-plasma resonant frequency and said match element resonant frequency.

Claim 60 (currently amended): The plasma reactor of Claim ~~39~~ 59 wherein each of said frequencies is a VHF frequency.

Claim 61 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode comprising a portion of said chamber wall;

an RF power generator capable of supplying power to said overhead electrode to maintain a plasma in said chamber at a desired plasma ion density;

a strip line circuit having a near end thereof adjacent said overhead electrode for coupling power from said RF power generator to said overhead electrode and providing an impedance transformation therebetween, said strip line circuit comprising:

a strip line conductor generally above said overhead electrode and connected at a near end thereof to said overhead electrode,

a ground plane conductor above said overhead electrode and spaced from said inner conductor along the length thereof and connected to an RF return potential of said RF power generator,

a tap at a selected location along the length of said strip line conductor, said tap comprising a connection between said strip line conductor and an output terminal of said RF power generator.

Claim 62 (original): The reactor of Claim 61 further comprising a shorting conductor connected at a far end of said strip line conductor to said ground plane conductor, whereby said far end of said strip line circuit is an electrical short.

Claim 63 (original): The reactor of Claim 62 wherein said strip line circuit has a strip line circuit resonant frequency, and the length of said strip line conductor between said near and far ends is equal to a multiple of a quarter wavelength of strip line resonant frequency.

Claim 64 (original): The reactor of Claim 63 wherein said multiple is two whereby said length of said strip line conductor is a half-wavelength at said strip line circuit resonant frequency.

Claim 65 (original): The reactor of Claim 63 wherein said

RF power generator produces a VHF power signal at a VHF frequency, said strip line circuit resonant frequency being a VHF frequency offset from the VHF frequency of said generator.

Claim 66 (original): The reactor of Claim 65 wherein said overhead electrode has a capacitance such that said electrode and said plasma at said selected plasma ion density resonate together at a VHF electrode-plasma resonant frequency, said VHF frequency of said generator lying between said electrode-plasma resonant frequency and said strip line circuit resonant frequency.

Claim 67 (original): The reactor of Claim 61 wherein said selected location is a location at which a ratio between standing voltage and current waves in said strip line circuit is at least nearly equal to an output impedance of said RF power generator.

Claim 68 (original): The reactor of Claim 67 wherein said selected location of said tap is shifted from an ideal location at which said ratio is equal to said output impedance, the shift being sufficient to realize an addition of current at said tap whenever the load impedance at said overhead electrode decreases below a nominal level and to realize a subtraction of current at said tap whenever the load impedance at said overhead electrode increases above a nominal level.

Claim 69 (original): The reactor of Claim 68 wherein the shift from said ideal location is about 5% of one wavelength of the strip line circuit resonant frequency.

Claim 70 (original): The reactor of Claim 68 wherein the shift from said ideal location is such that at least a 6:1 increase in resistive match space is realized.

Claim 71 (original): The reactor of Claim 61 wherein said characteristic impedance of said strip line circuit is about 30% less than the output impedance of said RF power generator.

Claim 72 (original): The reactor of Claim 61 wherein said strip line circuit has a characteristic impedance which is less than the output impedance of said RF power generator.

Claim 73 (original): The reactor of Claim 61 further comprising an insulating seal between said overhead electrode and a remaining portion of said chamber wall, the dielectric constant of said insulating seal and the area of said overhead electrode being such that the plasma at said selected plasma ion density and said overhead electrode resonate together at a VHF electrode-plasma resonant frequency.

Claim 74 (original): The reactor of Claim 61 further comprising an HF frequency bias power generator and an impedance match circuit connected between said HF frequency bias power generator and said wafer support.

Claim 75 (original): The reactor of Claim 74 wherein said wafer support provides an RF return path for VHF power coupled into said chamber from said overhead electrode.

Claim 76 (original): The reactor of Claim 75 further comprising a semiconductive annular ring surrounding the periphery of said wafer, said ring extending an effective return electrode area presented to VHF power coupled into said chamber from said overhead electrode.

Claim 77 (original): The reactor of Claim 76 further comprising an insulating annulus supporting said ring and

insulating said ring from said chamber wall, the dielectric constant of said ring determining apportionment of VHF power return current between said wafer support and said semiconductor ring.

Claim 78(original): The reactor of Claim 76 wherein the effective return electrode area for VHF power coupled into said chamber from said overhead electrode exceeds the area of said overhead electrode.

Claim 79 (original): The reactor of Claim 61 wherein said overhead electrode together with said strip line circuit provides an RF return path for HF power coupled into said chamber from said wafer support, said overhead electrode having an area greater than the area of said wafer support.

Claim 80 (original): The reactor of Claim 79 further comprising:

an isolation capacitor insulator between said strip line conductor and said overhead electrode, said capacitor providing an HF resonance in said RF return path and a short circuit at VHF frequencies.

Claim 81 (original): The reactor of Claim 80 wherein said HF resonance is at the fundamental frequency of said RF power generator.

Claim 82 (original): The reactor of Claim 80 wherein said HF resonance is at a plasma sheath-generated harmonic of the fundamental frequency of said RF bias power generator.

Claim 83 (original): The reactor of Claim 80 wherein said harmonic is the second harmonic.

Claim 84 (original): A method of processing a semiconductor wafer in a plasma reactor chamber, comprising:

providing an overhead electrode having an electrode capacitance and a VHF power generator;

coupling said VHF power generator to said overhead electrode through an impedance matching strip line circuit having a strip line conductor length which is a multiple of about one quarter of a VHF strip line circuit frequency and connected at one end thereof to said overhead electrode and connected at a tap point therealong to said VHF power generator;

applying an amount of power from said VHF power generator to said overhead electrode to maintain a plasma density at which said plasma and electrode together tend to resonate at a VHF frequency at least near the VHF frequency of said VHF power generator.

Claim 85 (original): The method of Claim 84 wherein said plasma density lies in a range of 10^9 through 10^{12} ions per cubic centimeter.

Claim 86 (original): The method of Claim 84 wherein the step of applying power matches a negative capacitance of the plasma to the capacitance of the electrode.

Claim 87 (original): The method of Claim 84 further comprising:

locating said tap at least near an axial location along the length of said strip line circuit at which the ratio between the standing wave voltage and standing wave current equals the output impedance of said VHF generator.

Claim 88 (original): The method of Claim 87 wherein said

locating comprises locating said tap at a position slightly offset from said axial location by an amount which realizes a significant increase in the resistive match space of an impedance match provided by said strip line circuit.

Claim 89 (original): The method of Claim 88 wherein said significant increase is on the order of a 6:1 increase.

Claim 90 (original): The method of Claim 89 wherein said position is offset by about 5% of the wavelength of said VHF generator.

Claim 91 (original): The method of Claim 84 wherein the VHF frequency of said VHF generator lies between said plasma VHF frequency and said strip line circuit VHF frequency.

Claim 92 (original): The method of Claim 84 wherein said multiple is 2 whereby the length of said strip line circuit is about a half wavelength at said stub frequency.

Claim 93 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support;

an RF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator;

an insulating layer formed on a surface of said overhead electrode facing said workpiece support;

a capacitive insulating layer between said impedance matching element and said overhead electrode;

a metal foam layer overlying and contacting a surface of said overhead electrode that faces away from said workpiece support.

Claim 94 (original): The reactor of Claim 93 wherein:

said insulating layer provides a capacitance sufficient to suppress arcing within said gas injection ports;

said capacitive insulating layer has a sufficient capacitance to block D.C. current from a plasma within said chamber from flowing through said overhead electrode while providing a low impedance path at the frequency of said RF power generator; and

said metal foam layer is of a sufficient thickness to suppress an axial electric field within said gas injection orifices.

Claim 95 (original): The reactor of Claim 93 further comprising a silicon-containing coating covering said insulating layer.

Claim 96 (original): The reactor of Claim 95 wherein said silicon-containing coating comprises one of silicon or silicon carbide.

Claim 97 (currently amended): The reactor of Claim 93<u>, wherein said impedance matching element comprises a fixed impedance matching element, and</u> wherein said fixed impedance matching element comprises a strip line circuit.

Claim 98 (currently amended): The reactor of Claim 93<u>, wherein said impedance matching element comprises a fixed impedance matching element, and</u> wherein said fixed impedance matching element comprises a coaxial tuning stub.

Claim 99 (original): The reactor of Claim 97 wherein said strip line circuit comprises a hollow strip line conductor connected to said RF power generator and extending to said capacitive insulating layer on said overhead electrode, said reactor further comprising:

at least one gas feed line extending through said hollow

strip line conductor and being coupled to said gas injection orifices of said overhead electrode.

Claim 100 (original): The reactor of Claim 98 wherein said coaxial tuning stub comprises a hollow inner conductor connected to said RF power generator and extending to said capacitive insulating layer on said overhead electrode, said reactor further comprising:

at least one gas feed line extending through said hollow inner conductor and being coupled to said gas injection orifices of said overhead electrode.

Claim 101 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode having plural gas injection orifices therein generally facing said workpiece support;

an RF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator, said impedance matching element having a hollow center conductor connected to said RF power generator and coupled to said overhead electrode; and

at least one gas feed line coupled to said plural gas injection orifices and extending through said hollow center conductor, whereby said gas feed line is electrically shielded by said hollow center conductor.

Claim 102 (currently amended): The reactor of Claim 101<u>, wherein said impedance matching element comprises a fixed impedance matching element, and</u> wherein said fixed impedance matching element comprises a strip line circuit and said hollow center conductor comprising a strip line conductor.

Claim 103 (original): The reactor of Claim 101 wherein said fixed impedance matching element comprises a coaxial tuning stub and said hollow center conductor comprises an inner coaxial conductor.

Claim 104 (original): The reactor of Claim 101 further comprising:

an optical window in said overhead electrode;

an optical conduit connected at one end thereof to said window and extending through said hollow center conductor of said impedance match element.

Claim 105 (original): The reactor of Claim 104 further comprising:

an optical detector connected to said optical conduit at an opposite end thereof.

Claim 106 (original): The reactor of Claim 104 wherein said optical conduit comprises an optical fiber.

Claim 107 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode having plural gas injection orifices therein generally facing said workpiece support;

an RF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator, said impedance matching element having a hollow center conductor connected to said RF power generator and coupled to said overhead electrode;

an optical window in said overhead electrode;

an optical conduit connected at one end thereof to said window and extending through said hollow center conductor of said impedance match element.

Claim 108 (original): The reactor of Claim 107 further comprising:

an optical detector connected to said optical conduit at an opposite end thereof.

Claim 109 (original): The reactor of Claim 108 wherein said optical conduit comprises an optical fiber.

Claim 110 (original): The reactor of Claim 107 wherein said impedance matching element comprises a strip line circuit and said hollow center conductor comprising a strip line conductor.

Claim 111(original): The reactor of Claim 107 wherein said impedance matching element comprises a coaxial tuning stub and said hollow center conductor comprises an inner coaxial conductor.

Claim 112 (currently amended): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode having plural gas injection orifices therein generally facing said workpiece support;

an RF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator, said impedance matching element having a hollow center conductor connected to said RF power generator and coupled to said overhead electrode;

a metal foam layer overlying said overhead electrode;

a capacitive ~~insulation~~ insulating layer between said center conductor and said overhead electrode.

Claim 113 (original): The reactor of Claim 112 wherein said capacitive insulating layer has a capacitance sufficient to block D.C. current from said plasma.

Claim 114 (original): The reactor of Claim 112 further comprising thermal control fluid passages within said overhead electrode.

Claim 115 (original): The reactor of Claim 112 further comprising an optical window in said overhead electrode generally facing said wafer support and a light carrying medium coupled to said window and extending through said overhead electrode.

Claim 116 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode having plural gas injection orifices therein generally facing said workpiece support;

an RF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator;

an insulating layer formed on a surface of said overhead electrode facing said workpiece support;

a capacitive insulating layer between said RF power generator and said overhead electrode, whereby said overhead electrode is capacitively isolated from said plasma and from said RF power generator.

Claim 117 (original): A plasma reactor for processing a

semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode having plural gas injection orifices therein generally facing said workpiece support;

a VHF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator;

an HF bias power generator coupled to said workpiece support;

a capacitive insulating layer between said RF power generator and said overhead electrode and having a capacitance that provides an RF return path from said plasma to said overhead electrode that is resonant at least near the HF frequency of said HF bias power generator and that has a negligible impedance at VHF frequencies.

Claim 118 (currently amended): The reactor of Claim 117, wherein said impedance matching element comprises a fixed impedance matching element, and wherein said fixed impedance matching element comprises a strip line circuit and said hollow center conductor comprising a strip line conductor.

Claim 119 (original): The reactor of Claim 118 wherein said fixed impedance matching element comprises a coaxial tuning stub and said hollow center conductor comprises an inner coaxial conductor.

Claim 120 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode having plural gas injection orifices therein generally

facing said workpiece support, said orifices comprising a radially inner group thereof and a radially outer group thereof;

an RF power generator and an impedance matching element coupled between said overhead electrode and said RF power generator;

radially inner and outer gas baffling layers within said overhead electrode coupled to respective ones of said radially inner and outer groups of orifices

first and second gas feed lines coupled to said radially inner and outer gas baffling layers respectively, said first and second gas feed lines being connectable to independently adjustable process gas sources for separate adjustment of gas flow rates at radially inner and outer locations.

Claim 121 (original): The reactor of Claim 120 wherein said impedance match element includes a hollow center conductor connected at one end thereof to said RF power generator and coupled at an opposite end there of to said overhead electrode, said first and second gas feed lines passing through said hollow center conductor.

Claim 122 (original): The reactor of Claim 121 wherein said impedance matching element comprises a coaxial stub and wherein said center conductor comprises a radially inner coaxial conductor.

Claim 123 (original): The reactor of Claim 121 wherein said impedance matching element comprises a strip line circuit and wherein said center conductor comprises a strip line conductor.

Claim 124 (original): The reactor of Claim 120 wherein the radially inner and outer gas baffling layers comprise metal foam material.

Claim 125 (original): A plasma reactor for processing a semiconductor workpiece, comprising:

a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor workpiece;

an overhead electrode overlying said workpiece support, said electrode being provided with an insulative surface and plural gas injection orifices generally facing said workpiece support;

an RF power generator for supplying power at a frequency of said generator to said overhead electrode and capable of maintaining a plasma within said chamber at a desired plasma ion density level;

a fixed impedance matching element connected between said generator and overhead electrode,

a capacitive insulating layer between said matching element and said overhead electrode;

a metal foam layer overlying and contacting a surface of said overhead electrode that faces away from said workpiece support.